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MCZ newsletter

MUSEUM OF COMPARATIVE ZOOLOGY

Mammal Department Receives Major Grant

The complete overhaul of the MCZ's extensive mammal collections, which was begun last year with the transfer of the alcohol collections and the dermestid beetle colonies to renovated bunker space at the Concord Field Station, will be continued with the assistance of a grant from the National Science Foundation Biological Resources Division, Systematic Collections. The initial grant is for a three-year period which we hope will be renewed for the duration of the ten-year project begun last year.



One of the overcrowded study skin drawers, to be expanded into freed-up space.

Among the much-needed projects to be undertaken are: the transfer of the whale skeletal material to more spacious quarters at the Concord Field Station; the replacement of the old wooden skin cases with new

airtight metal ones; and the consolidation of the various parts of the collections of small mammals so that researchers will be able to find the skin and skeleton of a particular bat or mouse in one drawer; these are currently housed in separate areas of the collections.

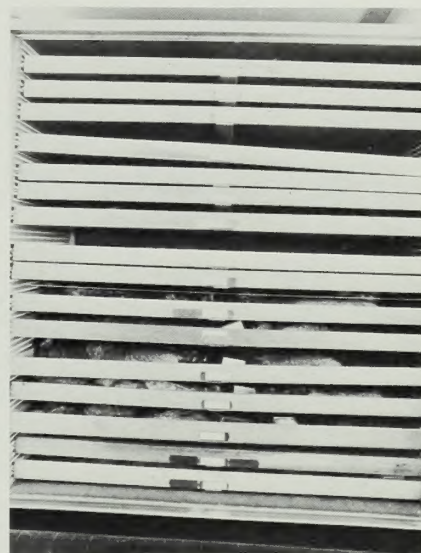
The Mammal Department is one of the most significant in the United



Cetacean material, to be transferred to the Concord Field Station.

States with important holdings of primates, particularly prosimians from Madagascar and gibbons from Southeast Asia, cetaceans from all the world's oceans and marsupials from Australia and South America. It becomes the fifth MCZ department to receive long-term support from the National Science Foundation since 1972. The collections of insects,

fish, reptiles and amphibians, and vertebrate fossils have already undergone extensive renovation.



Wooden study skin cases to be replaced.

Photos by Jane Winchell

New Name for Four-Museum Complex

"Harvard University Museums of Natural History" is the new name for the four-museum complex which includes the MCZ, the Peabody Museum of Archaeology and Ethnology, the Botanical Museum, and the Geological and Mineralogical Museum. Formerly known as the Harvard University Museums, the new name has been chosen to avoid confusion between this complex and the Harvard University Art Museums. The four museums continue to be separate administrative entities; the new name is to more accurately portray the museums for the general visiting public.

Visitors

The densely populated Population Genetics Department is hosting Michel Veuille and Jean-Pierre Berlan, two researchers from France, this academic year.



Michel Veuille

Michel Veuille, from the University of Paris, is realizing a long-cherished dream by spending the year working on molecular genetical polymorphism in Richard C. Lewontin's laboratory. His former studies were on the genetic variation in behavior in the fruit fly, *Drosophila melanogaster*, to experimentally determine whether avoidance of mating between relatives, a phenomenon often advocated to occur on theoretical grounds, influences mating behavior in this species. By hybridizing flies which have been made homozygous, all originating from the same population, he experimentally created hundreds of identical twins for each genotype. In 2,700 confrontations between 13 lines of heterozygous twins, Veuille found that they mated as frequently with related as with unrelated individuals. Hence, "incest avoidance" behavior does not occur in the geneticists' favorite species. Furthermore, the experiments evidenced a large genetic variation in mating characters in both males and females; wild populations of this insect are highly polymorphic, even at the level of behavior.

Jean-Pierre Berlan is an economist from the Institut National de la Recherche Agronomique collaborating with Lewontin on a study of the interface between biology and economics. He is particularly interested in the relationship between property rights and genetics in the case of hybrid corn. Berlan is currently concerned with the scientific, economic and historical development of hybrid corn and questions the conventional wisdom that a scientific discovery, heterosis, which led to a far-reaching technological change (hybridization) increased corn yield by a large margin. He suggests rather that the thrust of this technological change was to create property rights over the genetic material. Hybrid corn did not increase yield but it increased profits.

As a student of the history of science, Berlan realizes the need to assess the social, political, and personal factors that influence both "pure" and applied scientists and explores these consequences in his far-reaching investigations.



Jean-Pierre Berlan

Travel Program

Two highly successful safaris to **Zambia, Zimbabwe, and Botswana** were conducted in August, one led by Melanie L. J. Stiassny, Assistant Professor of Zoology and Assistant Curator of Ichthyology, and Gabrielle Dundon, Director of Public Programs, the other by graduate students Robert Dorit and Gillian Kendall. Both groups were fortunate to see leopards as well as all the more

commonly seen mammals. Another expedition to the same area is planned for January, the best birding season, with Dr. Alfred W. Scott of the Harvard Medical School as bird expert. The same trip is offered again in August, 1986 to be led by graduate student Mark W. Skinner. Brochures for this program will be mailed shortly.



Mark W. Skinner, scientific guide for the August trip to Zambia, Zimbabwe, and Botswana.

Photo by Shawn Lum



A misty view of Victoria Falls.

Photo by Melanie L. J. Stiassny

"The Nature and Culture of **India**" in February, led by Dr. John C. Constable, James Moore, and Rosanne Kumins is entirely filled with a waiting list.

Next spring's **Provincetown** whale-watching weekend will be on May 17-18. Stormy Mayo will bring the group up to date on his group's research on the local whales.

Plans for 1987 include:

A two-week **Antarctica** expedition in January aboard the *Society Explorer*. Director James J. McCarthy will be our scientific guide. This trip will be conducted jointly with the California Academy of Science with John McCosker, Director of the Steinhart Aquarium, as scientific guide.

A nostalgic return to the lagoons and islands off the **Baja California** peninsula in March for those who have fond memories from one or more of our many trips to that area. There may be space for a few fortunate first-timers.

A relaxed visit to **Malawi** is planned for August, led by Melanie L. J. Stiassny, who has studied the fishes in the lake there and looks forward to introducing travelers to the natural beauty of this small African country. The trip will end with a stay at Chinzombo Safari Camp in Luangwa National Park, Zambia—a highlight of our current trips to that country.

Benjamin Shreve 1908-1985

Benjamin Shreve, who worked in the Department of Herpetology for fifty years, died on July 16. At a Memorial Service held in Harvard's Appleton Chapel on October 4, Ernest E. Williams, Curator of Herpetology *Emeritus*, honored his memory with a vivid account of his life and service.

A member of the Herpetology Department for 50 years, Mr. Shreve did not have formal training but was personally tutored by Arthur Loveridge who was Curator of Herpetology from 1924 to 1957. According to Williams:

"Loveridge was an Englishman who had become an expert on African

amphibians and reptiles. He had come to Harvard to oversee a world collection but his heart was still in Africa. He therefore trained Ben quite deliberately to take over all the work of the Department that dealt with New World animals. Loveridge taught Ben and gave him little tests. He obviously found in Ben a good scholar. Within a year Ben was adept at the tasks that Loveridge had set him. Within two years, Ben was in

history. He contributed definitively, substantively to the building of the Department that is probably the largest, and, I would say, the best in the world . . . In still another sense Ben is part of Harvard's history. He was one of the last of the generations that believed that privilege was married to responsibility, who worked—even without pay—because they could not conceive a plausible alternative. He outlived most of the gen-



Benjamin Shreve

full charge of the Department when Loveridge was away in Africa for a full year. Loveridge began referring to Ben in the Annual Reports of the Department as "my colleague;" it was not a term that Loveridge would have used lightly. Soon Ben was writing papers with the then Director of the Museum, Thomas Barbour. Ben did the work. Barbour revised some of the language to suit his personal style . . ."

When Williams became Curator of the Department in 1957, Shreve continued to be an invaluable assistant. Williams summarized his role thus:

"Ben is genuinely part of Harvard's

eration for which this was reality. Within the Museum there are now few who knew him at all, almost no one who knew him well—and none at all cast in his mold . . . Ben described some 60 new forms of amphibians and reptiles. That itself by the rules of the game of Zoology is a claim to immortality . . . Some species were named after him. That is another claim to immortality . . . Ben served under five Directors of the Museum of Comparative Zoology, four Presidents of Harvard, three Curators of Herpetology. He gave 50 years of his life to Harvard, to the Department of Herpetology in the Museum of Comparative Zoology."

Fish Department Abounding in Awards

Several aspects of the work of the MCZ's Fish Department have been boosted recently by recognition and financial support. Curator Karel F. Liem has acquired a high-speed video system with the aid of a grant from the National Science Foundation; Assistant Curator Melanie L. J. Stiassny has received a grant "to further the career of a young woman science faculty member"; graduate student Laurie Sanderson was awarded part of the Raney Fund for Ichthyology of the American Society of Ichthyologists and Herpetologists in recognition of her work in the combined field of ecomorphology; and a substantial grant from the Biological Resource Research Program of the National Science Foundation is providing for the establishment of an archival collection of fish larvae at the MCZ with the expert assistance of Visiting Scholar Sally Richardson.

Karel F. Liem

The new high speed video system allows researchers to shoot 200 "fields" per second and produce relatively high resolution pictures lit by a cool stroboscopic lighting system which flashes 200 times per second. In the past, attempts to use high speed movie cameras have been unsatisfactory because the light source generated too much heat and so much light was required that the fish's behavior was affected adversely. With the new high speed

technology will allow a more quantitative approach because data can be acquired more rapidly. The new acquisition is part of a grant to study air ventilation in primitive lungs. Liem is interested in the functional aspects of the evolution of lungs during the transition from aquatic to terrestrial life in vertebrates and keeps primitive lung fishes in the laboratory for this work. Since air-breathing is very fast in fishes—they require only a 25,000th of a second to take a gulp of air—the use of high speed equipment is essential to record and analyze the process.

Melanie L. J. Stiassny

A generous contribution from Mrs. Joan Morthland-Hutchins is allowing Stiassny to plan the next

Foundation for an extended study. The unexpected gift came with the stipulation that the young woman scientist recipient be prepared to spend a day at St. Paul's School in Concord, New Hampshire to serve as a role model for the students with a goal to inspiring them to consider careers in the sciences. Stiassny looks forward to fulfilling this requirement.

Laurie Sanderson

The Raney Fund for Ichthyology, awarded by the American Society of Ichthyologists and Herpetologists, is to support "young ichthyologists and herpetologists for museum or laboratory study, travel, fieldwork, or any other activity that will effectively enhance their professional careers and their contributions to the science of ichthyology or herpetology." Sanderson is particularly gratified to receive an award from this fund this year because it indicates that the three diverse members of the judging panel agree that her research work, which centers on the difficult interface between the two disciplines of ecology and morphology, is worthy of recognition and encouragement.

As an undergraduate student at the University of Hawaii, Sanderson concentrated on the ecology of coral reef fishes. She censused and collected large numbers of wrasses, in the diverse and abundant family Labridae, and analyzed their stomach contents as part of an ecological study on marine foodchains. She found that in this family, made up of species with remarkably different structures, there is a surprising variety of diets. The fish generally fall into two categories: the generalists, with far-ranging tastes, and the specialists, with a narrower dietary range. The ecological explanation for how all the various members of the family coexist is that they fill different food niches. What Sanderson wanted to study was how the fishes partition the food resources by looking at the actual movements and neuromuscular activity when a fish captures its prey.

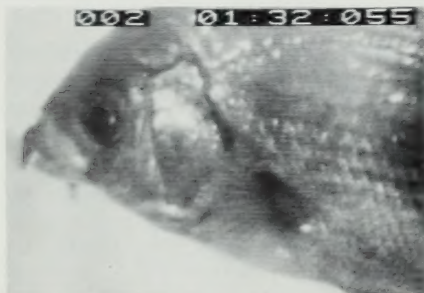
In the process of deciding on a graduate program which would be



Melanie Stiassny

Photo by S. Patterson

phase of her research work, a comprehensive study of the cichlid fishes of Lake Tanganyika. Of the over 200 species of cichlid fishes in the lake, an astonishing 95% are endemic to it. Stiassny will travel to Lake Tanganyika and establish contact with a team of Japanese scientists who are working in the area. She will gather sufficient data to provide the basis for a grant to the National Science



Pile perch feeding on a limpets, photographed by high-speed video.

video system, there is no need for an intense light source, and thus the animals are undisturbed and behave normally. Most importantly, the new

compatible with her interests, she was attracted to Karel Liem's laboratory and his approach of looking at evolutionary and ecological questions from the viewpoint of functional morphology. In general,

ecologists tend to look at structure in an adaptive sense and see how it influences the animal in its environment; they do not usually look at how the structure functions. Morphologists, on the other hand, conduct

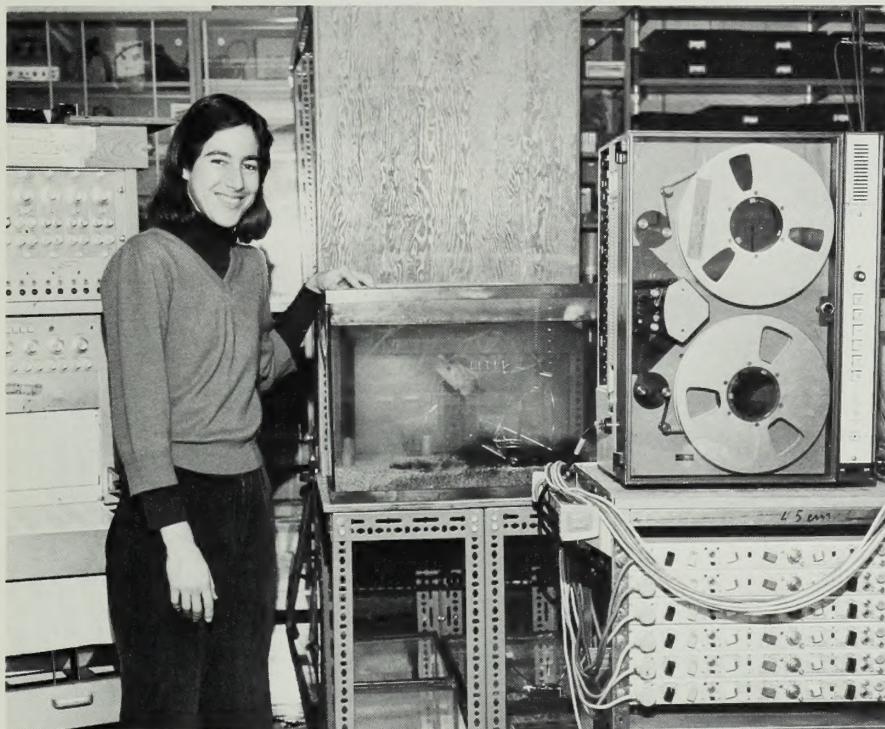
intensive studies on how structures function and the constraints they are subjected to; they do not usually consider the interface between the animal's behavior in the laboratory and in the wild. Some overlapping studies have been done in the last 10-15 years but Sanderson's is one of the few quantitative ecomorphological studies on fishes. Liem's expertise in electromyography and the availability of this equipment in the laboratory, as well as the new high speed video camera, have made Sanderson's study possible.

To date her work has yielded some unexpected results. In analyzing the electromyographic data in four different species, two generalists and two specialists, she has found that their muscular activity is remarkably similar regardless of the prey being devoured. High-speed filming, which allows the researcher to record how the mouth opens and to plot the gape with time as a way to quantify movement parameters, reveals differences caused by variation in mouth shape but otherwise there is a surprising similarity in the species studied.

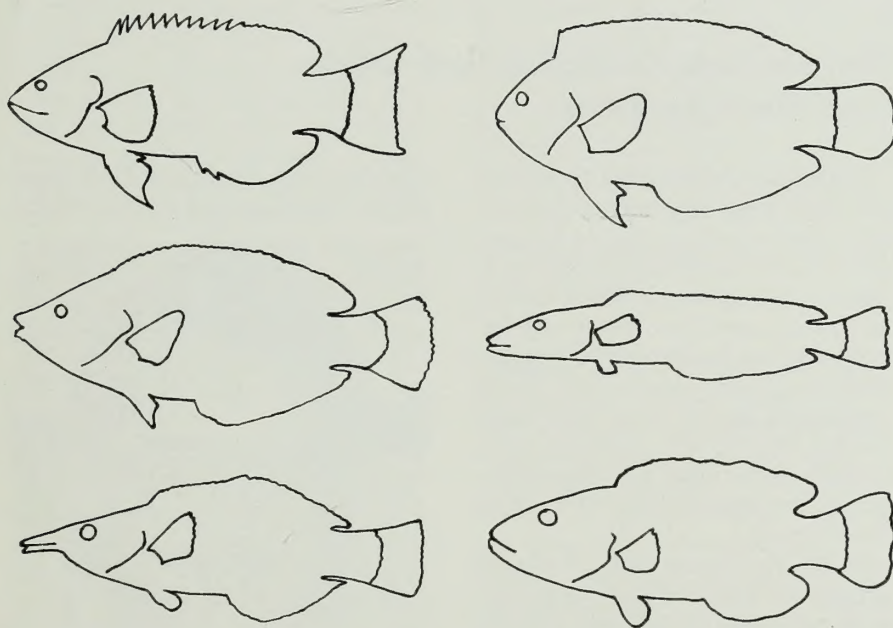
These findings suggest to Sanderson that the specialist species partition the food resources on the basis of their morphology, such as large mouth, big teeth, long snout, etc., and not on functional muscular activity; generalists do not have such specialized features. The labrids' behavior in the field also seems to be more important than their muscular activity. This is inconsistent with the conclusion Liem has drawn in his extensive study of cichlid fishes where there seem to be striking differences in neuromuscular patterns among the specialist species.

One possible explanation for the lack of differentiation in muscle activity in labrids could be that they are constrained in the number of ways they can open their mouths. The fact that two of their facial bones, the premaxilla and the maxilla, are tightly linked could be the reason there is little variation. A systematic study of a large number of generalists and specialists is needed to confirm this theory.

(Continued on next page)



Laurie Sanderson with electromyographic equipment and fish.



Drawing by Laurie Sanderson

General forms for some members of the remarkably diverse family Labridae, (l. to r.) *Bodianus bilunulatus*, *Macropharyngodon geoffroy*, *Anampses cuvier*, *Cheilodactylus inermis*, *Gomphosus varius*, *Cheilinus unifasciatus*.

Fish Department

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Sally Richardson

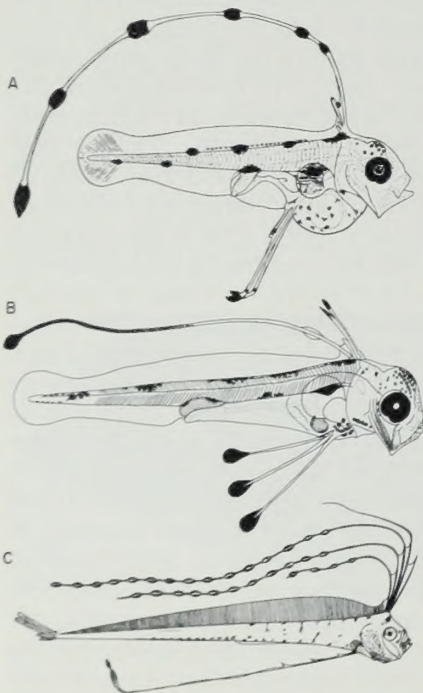
Visiting Scholar Richardson is at the MCZ for a year-and-a-half establishing what will become a major archival center of fish larvae in the United States. This is the first time the Biological Resource Research Program of the National Science Foundation has singled out one institution to become a center for a world-wide collection of larval fishes. According to Liem: "The study of fish larvae is vital to many areas of investigation including evolutionary studies, plankton distribution patterns, and fisheries management."

Many of the collections currently being identified, organized and catalogued in renovated quarters in the MCZ's basement were donated by the Woods Hole Oceanographic Institution and cover the North Atlantic, Caribbean, and South Atlantic off Africa and Brazil. Material also hails from Australia and the Department is amassing local collections from coastal Maine and Massachusetts.

Richardson, who was previously affiliated with the Gulf Coast Research Laboratory and Oregon State University School of Oceanography, was an organizer of the Ahlstrom Symposium on "Ontogeny and Systematics of Fishes" held in La Jolla, California in August, 1983. She was also an editor of the publication of that symposium by American Society of Ichthyologists and Herpetologists which was awarded a silver medal of excellence by the United States Department of Commerce, National Marine Fisheries Service. She asserts that the symposium "contributed to a new wave of thinking about and using larval fishes in systematic and evolutionary studies by getting together larval and adult-fish experts." She is interested in the generative and regulatory roles of development in fish evolution, and thinks perspectives from both larval and adult fish workers have a great deal to contribute to our conceptual understanding of the subject. The collections are being organized systematically rather than geographically and are already proving invaluable to visiting researchers. An active loan program is also underway.

Staff Notes

Stephen Jay Gould's *The Flamingo's Smile; Reflections in Natural History*, the fourth volume of highly-praised essays which first appeared in *Natural History*, was published this fall. **Ed Haack**, who designs, constructs, and maintains the MCZ's exhibits, spent five months this year "on loan" to the Harvard University Art Museums to help ready the new Sackler Museum for opening. He has recently returned, refreshed from the experience and armed with new ideas and techniques to apply to the MCZ's exhibits. **Ruth D. Turner** has been elected Chairman of the Biological Sciences section of the American Association of the Advancement of Science. She is also the American chairman of the upcoming Conference on Marine Biodeterioration being held in Goa, India in January. **Alfred Newton** has left his position as Curatorial Associate in Entomology to become Assistant Curator of Insects at Chicago's Field Museum. **Scott Shaw**, Visiting Curatorial Associate in Entomology for the past year, has been appointed as the new Curatorial Associate.



Some representative larval fishes illustrated in the Ahlstrom Volume
A: Scalloped ribbon fish, *Zu cristatus*;
B and C: Oarfish, *Regalecus glesne*.

How Do Ants Recognize Each Other and Other Questions

Students of sociobiology know that one of the basic tenets is that altruism, which would appear to be contrary to an individual's interests if reproductive success is the operative for natural selection, works to the individual's self-interest if aid is lavished on closely-related kin. Thus "helpers at the nest" in many bird species, for example, turn out to be siblings who have a compelling genetic investment in the survival of the offspring.

In the highly-developed social structure of an ant colony the ability to recognize kin is not only crucial but also a complicated behavior. It has long been known that chemistry governs the mechanism of recognition between sisters. Norman Carlin, a sixth-year graduate student

working with Professor Bert Holldobler, is attempting to find out the



Norman Carlin

source of the chemical substance within the social unit of the colony.

In a paper published in *Science* entitled "Nestmate and Kin Recognition in Interspecific Mixed Colonies of Ants" Carlin reports on the results of experiments in the laboratory in which he manipulated colonies in various ways to assess the role of the queen in chemical communication. That chemical cue recognition is a learned behavior is a fact



Two unrelated workers, adopted into a mixed colony, exchange food.

that ants themselves exploit; slave-makers raid other colonies, killing the slave adults and capturing the larvae and pupae who grow up learning to serve their new masters. Imitating the ants, Carlin creates mixed colonies for his experiments. While mixed colonies can be artificially created by slave-makers and graduate students, they also occur naturally in cases, for instance, when a queen mates with more than one male, creating a genetically-mixed colony. Half-sisters in the same colony would reject each other if they did not learn to recognize chemical cues different from their own. Carlin speculates that instances like this could explain why learning is required.

Once he created a mixed colony of ants of the genus *Camponotus*, (carpenter ants), Carlin reintroduced some of the workers into their original colony to see if they would recognize their own genetic sisters. The presence of the queen causes aggression between unfamiliar sisters leading him to believe that the queens have seized control of the recognition system by producing superabundant and/or super-potent



A queen surrounded by her own offspring (brood and dark workers) and an adopted worker (of another species) who feeds her by regurgitation.



Workers killing their own genetic sister who was adopted into an alien colony and acquired its odor.

Photos by Bert Holldobler

chemicals which blanket the chemical system. He has found that, if there is no queen present, unfamiliar sisters will recognize each other.

In a complementary study, Robin Stuart, a postdoctoral student working with Professor Edward O. Wilson, has found that in acorn ant colonies, which have multiple queens, the queen's influence is less overpowering.

In another study on learned behavior, Carlin trained soldier ants to fight introduced ants that are not their natural enemy. His findings,

reported in a joint article "Learned Enemy Specification in the Defense Recruitment System of an Ant" with Ardis B. Johnston of the MCZ's Invertebrate Department published in *Naturwissenschaften*, confirm that ants will learn to recognize and recruit soldiers to attack any other ant species that is repeatedly introduced into the colony. Carlin will attempt to isolate which ants in the colony are doing the learning by marking individuals, and to analyze the system to understand exactly what mechanism in the ant controls behavior.

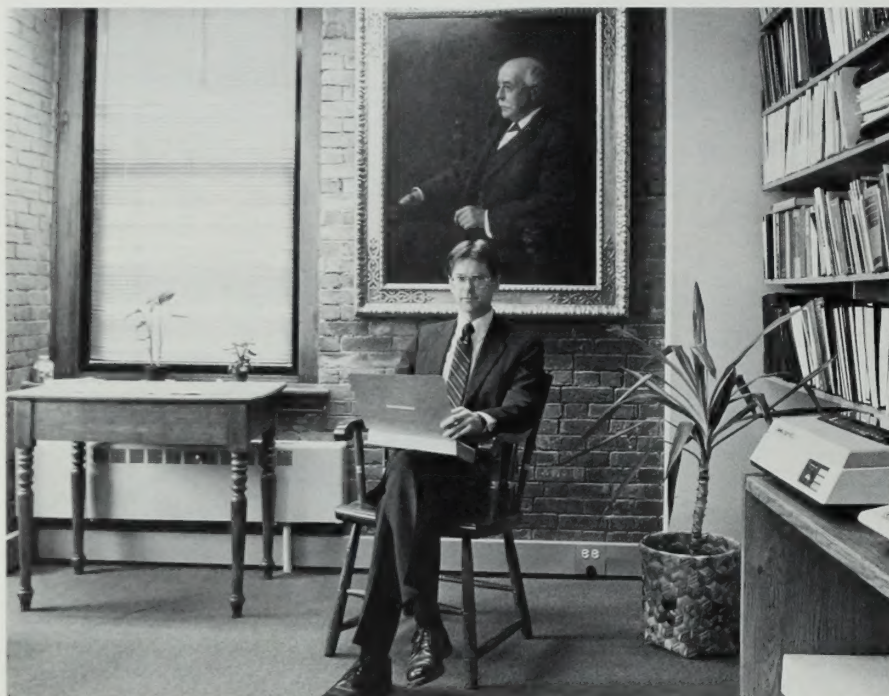
Administration In New Location

Over the past two years, several of the MCZ's administrative functions have been merged with those of the Department of Organismic and Evolutionary Biology, the Gray and Farlow Herbaria, the Botanical Museum, the Bussey Institute, and the Atkins Garden endowment resulting in increased efficiency and significant savings in personnel and space. Last fall the administrative offices of the combined administrations moved into newly renovated space on the ground level and first

floor space previously occupied by the Botanical Museum.

According to Jay Taft, Director of Administration: "We are now very close to the administrative structure which was envisioned four years ago."

The Departments of Public Programs and Education also moved to offices adjacent to the main public entrance to the museum, giving immediate access to the visiting public.



Jay Taft, Director of Administration, in his new administrative office.



New quarters for the Financial Office. Staff includes (l. to r.) Donna McDermott, Mack Davidson, Diane Cox, and Cathy Fico.

Naked Mole Rats



Naked mole rats collected by Rodney Honeycutt and Kimberlyn Nelson of the Mammal Department on recent Kenya expedition. These rats are the only vertebrates known to have a eusocial system similar to ants. A complete report on the study will appear in a future issue of the MCZ Newsletter.

The MCZ Newsletter is published two or three times a year by the Museum of Comparative Zoology, Harvard University, Oxford Street, Cambridge, Massachusetts 02138; James J. McCarthy, Director.

Editor: Gabrielle Dundon
Photographer: A. H. Coleman

